

# Efficacy of Structural-Level Condom Distribution Interventions: A Meta-Analysis of U.S. and International Studies, 1998–2007

Mahnaz R. Charania · Nicole Crepaz ·  
Carolyn Guenther-Gray · Kirk Henny ·  
Adrian Liao · Leigh A. Willis · Cynthia M. Lyles

Published online: 1 October 2010

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**Abstract** This systematic review examines the overall efficacy of U.S. and international-based structural-level condom distribution interventions (SLCDIs) on HIV risk behaviors and STIs and identifies factors associated with intervention efficacy. A comprehensive literature search of studies published from January 1988 through September 2007 yielded 21 relevant studies. Significant intervention effects were found for the following outcomes: condom use, condom acquisition/condom carrying, delayed sexual initiation among youth, and reduced incident STIs. The stratified analyses for condom use indicated that interventions were efficacious for various groups (e.g., youth, adults, males, commercial sex workers, clinic populations, and populations in areas with high STI incidence). Interventions increasing the *availability* of or *accessibility* to condoms or including additional individual, small-group or community-level components along with condom distribution were shown to be efficacious in increasing condom use behaviors. This review suggests that SLCDIs provide an efficacious means of HIV/STI prevention.

**Keywords** HIV/AIDS prevention · Behavioral interventions · Condom distribution · Structural interventions · Meta-analysis

*Disclaimer:* The findings and conclusions in this report are those of the authors and do not necessarily represent views of the U.S. Centers for Disease Control and Prevention.

M. R. Charania (✉) · N. Crepaz · C. Guenther-Gray ·  
K. Henny · A. Liao · L. A. Willis · C. M. Lyles  
Prevention Research Branch, Division of HIV/AIDS Prevention,  
Centers for Disease Control and Prevention, 1600 Clifton Road,  
Mailstop E-37, Atlanta, GA 30333, USA  
e-mail: MCharania@cdc.gov

## Introduction

In most parts of the world, unprotected sex continues to be the leading cause of HIV infections [1]. In the United States, approximately 56,000 new HIV infections were diagnosed in 2006, and over 80% were attributed to unprotected sex [2, 3]. High-risk heterosexual contact accounted for 31% of the new cases, whereas unprotected sex among men who have sex with men accounted for 53% of the new cases [2, 3]. In the absence of an effective vaccine, protective behavior such as consistent and correct condom use continues to be the most effective strategy to reduce HIV transmission risk among sexually active heterosexual and MSM populations.

There are various existing approaches that promote condom use among people at high risk for sexual transmission of HIV. Individual-level interventions (ILI) and group-level interventions (GLI) directly address knowledge, attitudes, skills, and behaviors related to condom use in persons participating in intervention activities in one-on-one settings or in existing (e.g., couple, family) or newly formed groups. Community-level interventions (CLI) also directly and indirectly address knowledge, attitudes and behaviors with the focus on the entire community and often with a strong emphasis on changing social norms [4]. Evidence suggests that ILIs, GLIs, and CLIs demonstrate moderate to high success in promoting condom use [5]. Disseminating these types of interventions, however, may not be sufficient in combating the HIV epidemic, since they do not address the social and structural system or environments in which individuals reside. These contextual factors have been found to be a critical influence on individuals' behaviors [6].

Structural-level interventions (SLIs) are particularly attractive in HIV prevention efforts since they are designed

to address contextual factors that impact personal risk for HIV. Blankenship et al. proposed three structural-level intervention components that address behaviors of interest in public health: availability, accessibility, and acceptability [7]. When applied to HIV prevention tools such as condoms (see Table 1), SLIs target availability by making establishments responsible for the behaviors of their clients or for providing settings or materials that would reduce client risk [7]. Examples include placing condom bowls in clinics or 100% condom use policies in brothels. SLIs that target accessibility typically do so by making condoms and prevention messages widely accessible (e.g., massive distribution of free condoms at multiple venues simultaneously) without focusing on a specific establishment or client type. Increasing accessibility to condoms is a particularly attractive option for reaching marginalized populations in an effort to compensate for social inequities in access to prevention tools. SLIs target acceptability by changing social norms towards condoms (e.g., public service announcements about benefits of using condoms). These three SLI components can be directed to individuals, organizations, or the environment (Table 1). Combinations of these SLI components are likely to positively influence condom use behaviors since they are implemented in settings where individuals reside, an aspect frequently overlooked by existing ILIs, GLIs, and CLIs [7].

Previous reviews have focused mainly on evaluating ILIs, GLIs, and CLIs that address condom promotion (e.g., teaching individuals how to use a condom, promoting a positive attitude toward condoms, giving participants condoms to use after intervention) rather than larger-scale distribution [8, 9]. Johnson et al.'s meta-analysis of HIV risk reduction interventions among adolescents found that educational, psychosocial, or behavioral interventions advocating sexual risk reduction for HIV prevention were significantly more efficacious among intervention participants compared to participants in the control arm [8]. Although 18% of these interventions provided condoms as part of the intervention, nearly all also included provision of condoms for control participants as well. Findings from Smoak et al.'s meta-analysis showed that safer sex

programs that provide condoms do not inadvertently increase sexual frequencies [9]. While those reviews are informative, the interventions evaluated in the reviews were limited to the small scale delivery (individual or group) and did not directly focus on or test structural-level approaches (i.e., improving availability, acceptability, and accessibility) in condom distribution programs.

The goals of this systematic review are to summarize the available research literature evaluating structural-level condom distribution interventions (SLCDIs), to meta-analyze quantitative data to assess the overall efficacy of SLCDIs on HIV-risk sex behaviors and sexually transmitted infections (STIs), and to assess whether structural-level intervention components (availability, accessibility, and acceptability) are associated with intervention efficacy. We also examine whether the level of implementation of SLI components (i.e., individual, organizational, or environmental) and the presence of any combination of additional ILI, GLI, or CLI components has a differential impact on the efficacy of SLCDIs. Additionally, we test whether intervention effects are applicable to various risk groups and to studies conducted in different countries or with different study designs.

## Methods

### Database and Search Strategy

We conducted various automatic and hand searches to ensure the inclusion of all the relevant citations. First, we searched the CDC HIV/AIDS Prevention Research Synthesis (PRS) project's cumulative HIV/AIDS/STI prevention database that was developed to identify, review, and synthesize HIV/AIDS/STI intervention research literature published since 1988 [10, 11]. Automated systematic searches are conducted annually to update the PRS database using search terms (i.e. index terms, keywords, and proximity terms) cross-referenced in three areas: (a) HIV, AIDS, or STI; (b) intervention and prevention evaluation; and (c) behavior or biologic outcomes related to HIV

**Table 1** Examples of condom distribution as structural interventions for HIV prevention

	Individual	Organizational	Environmental
Availability	Condom machines; Condom bowls; Providing condoms at a cost; Providing coupons for condoms	100% condom-use policies (e.g., in brothels); Making condoms available in prisons	Increasing federal funds for making condoms available
Acceptability	Distributing promotional items (e.g., flyers promoting condom use to teenagers)	Television programming; PSAs; Media campaigns; Community mobilization	Social marketing campaigns
Accessibility	Massive distribution of free condoms	Developing and producing female condoms; Expanding of publicly funded condom distribution centers/posts (e.g., mobile vans)	Policy change

Modified based on Blankenship et al. [7]

infection or transmission (e.g., condom use, unprotected sexual partner, number of sex partners, STI and HIV incidence) [11]. This search is conducted each year in AIDSLINE (discontinued in 2000), EMBASE, MEDLINE, PsycINFO, and Sociological Abstracts, using the OVID search platform. Due to indexing gaps, a manual search of 35 key journals, which regularly publish HIV or STI prevention research, is performed quarterly to locate additional intervention reports. Second, we conducted a separate automated search in October, 2007 in MEDLINE, EMBASE, and PsycINFO using the keyword “condom” and various synonyms for the term “distribution” (e.g., access, disperse, market, provide, provision, promote, distribution, availability and dispense) to identify reports relevant to condom promotion and distribution. An additional supplemental search was later performed in the Cochrane Library for the keyword “condom” or “condoms”. CINAHL was considered for this review. However, prior testing of our more general annual PRS search proved significant overlap between CINAHL and the other databases and, thus, did not warrant a separate search. We also reviewed the reference list of all relevant studies to identify additional citations.

### Study Selection

All citations retrieved through these searches were screened in October and November of 2007 for inclusion based on the following eligibility criteria. International and U.S.-based studies were included if they met all of the following criteria: (1) they reported on a HIV/AIDS/STI behavioral intervention that focused on condom distribution as a structural component that targeted acceptability, availability, or accessibility of condoms (defined in Table 1); (2) data were collected on at least one behavioral outcome (i.e., condom use, unprotected sex, number of sex partners, abstinence, sexual initiation, condom acquisition, or carrying a condom) or biological outcome (i.e., clinical or lab-confirmed HIV or STI diagnosis); (3) intervention effects were evaluated by comparing data from an intervention arm receiving a SLCDI and a comparison arm not receiving a SLCDI (from a randomized controlled trial (RCT) or non-randomized controlled trial), or data from independent cross-sectional samples assessed before and after implementation of a SLCDI; (4) English-language reports published from January 1988 through September 2007; and (5) sufficient data were available for calculation of effect sizes.

### Data Abstraction and Quality Assessment

Information from eligible reports was independently coded by pairs of trained reviewers. Linkages among reports were identified to ensure that multiple reports describing an

intervention were included in the coding and analyses. Using standardized coding forms, each intervention was coded for study characteristics (e.g., study location and dates), participant characteristics (e.g., target population, race/ethnicity, age, gender), and intervention characteristics (e.g., intervention components, delivery method, duration, and setting). For more specific coding of intervention components, we assessed (1) whether the structural component targeted the availability, acceptability, or accessibility of condoms (Table 1); (2) whether the structural component was implemented at the individual, organizational, and/or environmental level; and (3) whether the intervention was implemented at the individual-level (ILI), group-level (GLI), or community-level (CLI), in addition to the structural-level. We assessed the methodological quality by coding for study design, type of comparison, retention rates, and intent to treat. We examined study heterogeneity and implemented stratified analyses to assess intervention efficacy based on study quality as opposed to using a composite quality scale due to the potential problems in the interpretation of these scales [12].

The pairs of reviewers also independently abstracted data relevant to the outcomes of interest, reconciled all discrepancies, and if they could not reach an agreement, then a third independent reviewer helped resolve the discrepancy.

### Analytic Approach and Meta-Analysis Methods

We used the following rules to guide the analytic data abstraction and effect size calculations. To ensure independence of effect sizes for studies with multiple arms, we selected the contrast between the most theoretically potent intervention arm and the comparison arm that was typically a standard of care or wait list control. For the condom use outcome, data from studies reporting unprotected sex were computed to reflect the percentage that ‘did not engage in unprotected sex’ in order to combine it with data from studies reporting condom use behavior. For studies that reported multiple follow-up assessments, we selected the longest post-intervention follow-up for assessing the longer-term intervention effect. We used data from adjusted models reported by the study authors for effect size calculation since such models typically control for baseline differences as well as potentially confounding variables. If adjusted data were not provided, and baseline data were reported, the effect sizes were calculated for the follow-up outcome data by adjusting for baseline differences [13].

Effect sizes (ES) for each study were estimated using odds ratio (OR) because the majority of the intervention studies compared two groups on a dichotomous outcome. The estimated OR for each study represents the intervention effect by estimating the relative odds of a particular outcome between the intervention and comparison arms

[14]. For intervention studies that reported means and SD values on continuous outcomes, the standardized mean differences were computed and converted into OR values [13]. For condom use, condom acquisition, and delay in sexual initiation/abstinence, an  $OR > 1$  indicates a greater increase in protective behavior in the intervention arm relative to the comparison arm. For number of sex partners and STD incidence, an  $OR < 1$  indicates a greater reduction in the outcome in the intervention arm relative to the comparison arm.

The natural logarithm of the odds ratio (or  $\ln OR$ ) and its corresponding estimated variance were calculated for each study. In estimating the overall ES, across all studies, we multiplied each  $\ln OR$  by its weight (or inverse variance), summed the weighted  $\ln OR$  across studies and then divided by the sum of the weights. The aggregated  $\ln OR$  was then converted back to OR by exponential function and a 95% confidence interval (95% CI) was derived to provide an overall intervention effect estimate across all studies.

We examined the magnitude of heterogeneity of the effect sizes by using both the Q statistic and Higgin's  $I^2$  index to indicate the level of heterogeneity [15, 16]. Sensitivity analyses were conducted to determine whether the overall results were sensitive to the aforementioned rules used for guiding ES calculation. In particular, we examined whether intervention efficacy was impacted by any study by comparing the aggregated ES estimate among all studies with the estimate obtained after excluding a study or a set of studies that might influence the overall estimate.

Stratified analyses were conducted to examine the factors (e.g., intervention features) associated with the intervention effects of SLCDIs. These analyses focused only on condom use behaviors because of the greater relevance of condom use to HIV transmission and also because there were a sufficient number of studies reporting on this behavior. Stratification variables used to characterize the intervention included the type of structural component (e.g., availability, acceptability, or accessibility), the level of implementation of the structural-level component (e.g., individual, organizational, or environmental level), and whether or not any additional ILI, GLI, or CLI component was included as part of the SLCDI. We first conducted "marginal effects" analyses to examine the effects of each of the three types of structural components and each of the three levels of implementation regardless of how they were combined within a single intervention. We then assessed the combinations of types of structural components and levels of implementation. We also examined the impact of additional ILI, GLI, and CLI components within the intervention on condom use.

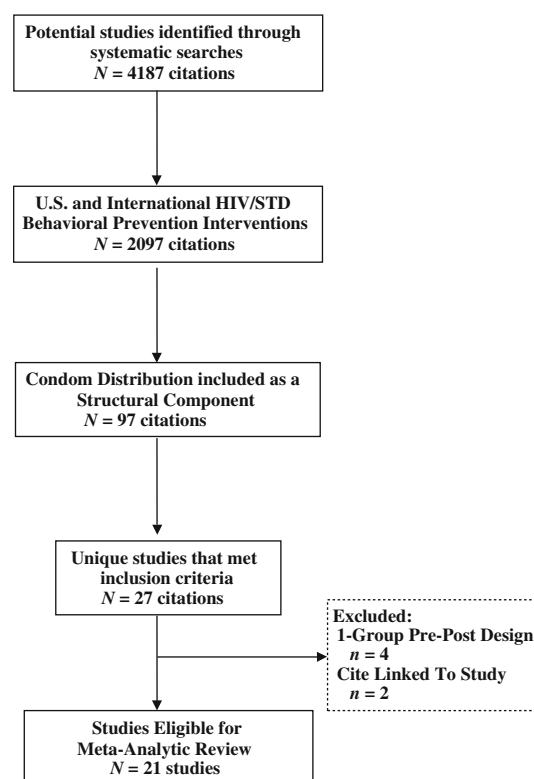
All overall and subgroup effect sizes and confidence intervals (Tables 3 and 4) were estimated using a random effects model. This model was used because it provides a

more conservative estimate of variance and generates more accurate inferences about a population of trials beyond the set of trials included in this review [17]. Within the stratified analyses (Table 4), between-group differences were tested using a mixed-effects model with the  $Q_B$  between-group test statistic. The Comprehensive Meta-Analysis software (version 2) (Comprehensive Meta Analysis, 2005) was used to perform the analyses based on both random-effects and mixed-effects model.

Publication bias, which may favor studies with significant findings, was ascertained by inspection of a funnel plot of standard error estimates versus effect size estimates from individual samples and also by a linear regression test [14].

## Results

We identified 21 SLCDIs (Fig. 1; Table 2) [18–35]. Two-thirds of the studies were conducted in international settings ( $k = 14$ ) [24–35], including 5 in Africa (2 in Tanzania, 2 in Cameroon, 1 in Ghana), 4 in East & Southeast Asia (2 in China, 1 in Indonesia, 1 in Thailand), 2 each in the Caribbean and Mexico, and 1 in Central America. Among the 7 studies conducted in the U.S. [18–23], two either specifically targeted (100%) or consisted of majority of African Americans (71.5%) and one specifically targeted



**Fig. 1** Systematic search and study selection

**Table 2** Description of 21 eligible structural-level condom distribution interventions

Author, study location and dates	Target population	Sample characteristics	Study description	Description of intervention arm	Relevant outcomes reported
U.S.-based studies ( $k = 7$ )					
Alstead et al. [18], Seattle, Washington (1995)	High risk youth	$N = 341$ ; 52% male, 48% female; ethnicity: 38% White, 30% AA, 16% Asian, 16% other; between ages 15 and 17	<i>Intervention duration</i> : 4 months <i>Assessment<sup>a</sup></i> : 2 and 7 months post-BL	<i>SLI</i> : Condom machines and bowls in public/private venues, distribution of promotional items, media campaigns, social marketing of condoms	% Condom use
Blake et al. [19], Massachusetts (1995)	Youth in school	$N = 4166$ ; 50.7% male, 49.3% female; ethnicity: 75.4% White, 8.2% Latino, 6.4% AA, 4.3% Asian, 5.8% other; mean age 16	<i>Intervention duration</i> : ongoing <i>Assessment<sup>b</sup></i> : 48 months post-BL	<i>SLI</i> : Condom machines placed throughout schools, state-wide policy change	% Condom use, % initiating sex Number of sex partners (insufficient data)
Cohen et al. [20], Los Angeles, California (1988)	STD clinic patients	$N = 903$ ; 61.3% male, 38.8% female; ethnicity: 71.5% AA, 20.6% Hispanic, 4.5% White, 3% Asian, 3.5% other, median age 27	<i>Intervention duration</i> : 1 month <i>Assessment<sup>b</sup></i> : 6–9 months post-BL	<i>SLI</i> : Unlimited supply of condom bags provided at local businesses for free <i>GLI</i> : Condom use demonstration in local health clinics	New STD infections (from medical charts)
Cohen et al. [21], Louisiana (1994–1996; Study #1)	High risk clinic patients	$N = 1614$ ; 100% female; ethnicity: 51% White, 45% AA, 4% unspecified; age NR	<i>Intervention duration</i> : Ongoing <i>Assessment<sup>a</sup></i> : 34 months post-BL	<i>SLI</i> : Expansion of publicly funded condom distribution posts (e.g., public health clinics, mental health centers, substance abuse treatment centers)	% Condom use, number of sex partners
Cohen et al. [21], 1999, Louisiana (1994–1996; Study #2)	High STD rate areas	$N = 300$ ; 100% male; ethnicity: 100% African American; between ages 15 and 45	<i>Intervention duration</i> : Ongoing <i>Assessment<sup>a</sup></i> : 12 and 24 months post-BL	<i>SLI</i> : Massive distribution of free condoms through private sector businesses	% Condom use, number of sex partners
Schuster et al. [22], Los Angeles, California (1992–1993)	Youth in school	$N = 1945$ ; 52% male, 48% female; ethnicity: 48% White, 27% Hispanic, 9% AA, 10% Asian, 6% other; 9–12 graders; age NR	<i>Intervention duration</i> : 12 months <i>Assessment<sup>a</sup></i> : 12 months post-BL	<i>SLI</i> : Condom bowls/packets placed outside classrooms and nurses' office <i>ILI</i> : Instruction sheet and cards with abstinence messages	% Condom use % Acquiring condoms (insufficient data)
Sellers et al. [23], Hartford, Connecticut; Boston, MA (1989–1992)	Youth	$N = 481$ ; 49.5% male, 50.5% female; ethnicity: 100% Latino; between ages 15 and 19	<i>Intervention duration</i> : 38 months <i>Assessment<sup>b</sup></i> : 18 months post-BL	<i>SLI</i> : condom bowls, distribution of promotional items, massive distribution of free condoms, tv programming and PSAs, social marketing of condoms, agency mobilization <i>GLI</i> : Group discussions at homes, workshops in schools <i>CLI</i> : Presentations at community events, workshops in communities	% Condom use, number of sex partners, % carrying condom, % initiating sex
International studies ( $k = 14$ )					
Asamoah-Adu et al. [24], Ghana, West Africa (1987–1991)	CSWs	$N = 71$ ; 100% female; mean age: 36	<i>Intervention duration</i> : 6 months <i>Assessment<sup>a</sup></i> : 6 and 51 months post-BL (latter occurred 3.5 years after program ended)	<i>SLI</i> : Massive distribution of condoms at organized meetings <i>GLI</i> : Group meetings at community settings and health clinics	% Condom use



Table 2 continued

Author, study location and dates	Target population	Sample characteristics	Study description	Description of intervention arm	Relevant outcomes reported
Egger et al. [25], Nicaragua, Central America (1997)	Couples	<i>N</i> = 4254; 50% male, 50% female; age NR	<i>Intervention duration</i> : 2 months <i>Assessment<sup>a</sup></i> : 2 months post-BL	<i>SLI</i> : Distribution of promotional items, distribution of free condoms in motel rooms	% Condom use
Ford et al. [26], Indonesia, East & Southeast Asia (dates NR)	CSW's, Male clients	<i>CSW's</i> : <i>N</i> = 376; 100% female; mean age 26; <i>Male clients</i> : <i>N</i> = 51; 100% male; age NR	<i>Intervention duration</i> : 6 months <i>Assessment<sup>a</sup></i> : 6 months post-BL	<i>SLI</i> : Condom use campaigns, distribution of promotional items, massive distribution of free condoms, media campaigns  <i>GLI</i> : HIV/STD education to pimps and CSW's	<i>CSW's</i> : % Condom use, % carrying condoms  <i>Male clients</i> : % Condom use
Kerrigan et al. [27], Puerto Plata, Dominican Republic, Caribbean (1999–2000; Study #1)	CSW's	<i>N</i> = 210; 100% female; between ages 18 and 25	<i>Intervention duration</i> : 14 months <i>Assessment<sup>a</sup></i> : 14 months post-BL	<i>SLI</i> : Condom bowls, condom use campaigns, distribution of promotional items, media campaigns <i>ILI</i> : Info booths; STI counseling and testing <i>GLI</i> : Quarterly workshops <i>CLI</i> : Interactive theatre presentations	% Condom use, number of sex partners, lab confirmed STD incidence
Kerrigan et al. [27], Santo Domingo, Dominican Republic, Caribbean (1999–2000; Study #2)	CSW's	<i>N</i> = 200; 100% female; between ages 18 and 25	<i>Intervention duration</i> : 14 months <i>Assessment<sup>a</sup></i> : 14 months post-BL	<i>SLI</i> : Condom bowls, condom use campaigns, distribution of promotional items, media campaigns, policy change efforts (sanctions for non-adherence) <i>ILI</i> : Info booths; STI counseling and testing <i>GLI</i> : Quarterly workshops <i>CLI</i> : Interactive theatre presentations	% Condom use, number of sex partners, lab confirmed STD incidence
Laukamm-Josten et al. [28], Tanzania, East Africa (1990–1993)	CSW's, Truck drivers	<i>CSW's</i> : <i>N</i> = 304; 100% female; median age: 24, between ages 15 and 50; <i>Truck drivers</i> : <i>N</i> = 425; 100% male; median age: 32, between ages 18 and 65	<i>Intervention duration</i> : 42 months <i>Assessment<sup>a</sup></i> : 18 and 42 months post-BL	<i>SLI</i> : Condom distribution at commercial outlets, hotels, bars, restrooms, condom use campaign, social marketing of condoms <i>GLI</i> : Small group discussions led by peer educators	<i>CSW's</i> : % Condom use, self-reported STD rate (not included in analysis), % carrying condoms  <i>Truck drivers</i> : % Condom use, self-reported STD rate (not included in analysis), % carrying condoms
Martinez-Donate et al. [29], Tijuana, Mexico (2001–2002; Study #1)	Youth in school	<i>N</i> = 198; 37% male, 63% female; mean age 18 years	<i>Intervention duration</i> : 6 months <i>Assessment<sup>a</sup></i> : 6 months post-BL	<i>SLI</i> : Condom kiosks <i>GLI</i> : 3 h HIV prevention workshop	% Unprotected vaginal sex, % acquiring condoms, % initiating sex
Martinez-Donate et al. [29], Tijuana, Mexico (2001–2002; Study #2)	Youth in school	<i>N</i> = 198; 37% male, 63% female; mean age 18 years	<i>Intervention duration</i> : 6 months <i>Assessment<sup>a</sup></i> : 6 months post-BL	<i>SLI</i> : Condom kiosks	% Unprotected vaginal sex, % acquiring condoms, % initiating sex
Meekers et al. [30], Cameroon, Central Africa (2000–2002)	High risk youth	<i>N</i> = 1956; 54% male, 46% female; between ages 15 and 24	<i>Intervention duration</i> : ongoing <i>Assessment<sup>a</sup></i> : 24 months post-BL	<i>SLI</i> : Venue-based sale of condoms, distribution of promotional items, tv programming, media campaigns, social marketing of condoms <i>CLI</i> : Street corner shows, peer education and promotion	% Condom use

**Table 2** continued

Author, study location and dates	Target population	Sample characteristics	Study description	Description of intervention arm	Relevant outcomes reported
Mhalu et al. [31], Tanzania, East Africa (1988–1989)	CSW's	<i>N</i> = 605; 43% male, 57% female; 33% less than 26 years old	<i>Intervention duration</i> : Ongoing <i>Assessment</i> <sup>b</sup> : 12 months post-BL	<i>SLI</i> : Massive distribution of free condoms at place of work <i>ILI</i> : General health education; HIV C/T	% Condom use, lab confirmed HIV and STD incidence
Sakondhavit et al. [32], Thailand, East & Southeast Asia (dates NR)	CSW's	<i>N</i> = 217; 100% female; mean age: 22, between ages 14 and 33	<i>Intervention duration</i> : 6 months <i>Assessment</i> <sup>b</sup> : 1, 2, 3, 4, 5, and 6 months post-BL	<i>SLI</i> : Massive distribution of free condoms via brothel managers, 100% condom use policy in brothels, making condoms available in brothels	% Condom use
Van Rossem et al. [33], Cameroon, Central Africa (1996–1997)	Youth and young adults	<i>N</i> = 1606; gender NR; between ages 12 and 22	<i>Intervention duration</i> : 13 months <i>Assessment</i> <sup>b</sup> : 13 months post-BL	<i>SLI</i> : Venue-based sale of condoms, distribution of promotional items, tv programming, media campaigns, community mobilization <i>ILI</i> : Peer education and counseling (also sold condoms) <i>CLI</i> : Community venues for “youth clubs” for youth to actively engage in social activities	% Condom use, number of sex partners, abstinence, % acquiring condoms
Xiaoming et al. [34], China, East & Southeast Asia (1996–1997)	Adults	<i>N</i> = 710; 48.5% male, 51.5% female; mean age 25 years, between 18 and 30 years	<i>Intervention duration</i> : 12 months <i>Assessment</i> <sup>b</sup> : 12 months post-BL	<i>SLI</i> : Venue-based sale of condoms, condom use campaigns, distribution of promotional items, massive distribution of free condoms, PSAs, community mobilization <i>ILI</i> : Individual counseling, home visits <i>GLI</i> : Workshops <i>CLI</i> : townships	% Condom use, number of sex partners, abstinence (not included in analysis)
Zhongdan et al. [35] <sup>c</sup> , China, East & Southeast Asia (2001–2003)	CSW's	<i>N</i> = 170; 100% female; mean age 20 years, between 15 and 31 years	<i>Intervention duration</i> : 15 months <i>Assessment</i> <sup>b</sup> : 6, 9, 12, 15, and 21 months post-BL	<i>SLI</i> : Condom machines, venue-based sale of condoms, 100% condom use policies in brothels, warnings for non-compliance (fines, loss of license) <i>ILI</i> : Discussions on HIV/AIDS transmission, STI counseling and testing <i>GLI</i> : Educational sessions; training workshops <i>CLI</i> : Formal meetings with establishment owners, local officials and police giving out condoms at public events	% Condom use, lab confirmed STD incidence

*SLI* structural-level intervention components, *CLI* community-level intervention components, *ILI* individual-level intervention components, *GLI* small-group level intervention components, *post-BL* post-baseline, CSW commercial sex workers, *NR* not reported, *k* indicates number of studies

<sup>a</sup> Intervention effects were evaluated comparing data from independent cross-sectional samples assessed before and after implementation of SLCDI

<sup>b</sup> Intervention effects were evaluated comparing data from an intervention group receiving SLCDI (structural-level condom distribution intervention) and a comparison group not receiving SLCDI

<sup>c</sup> This citation was originally identified as a 2007 e-publication in the search

Latinos; 2 studies consisted of majority of whites (75.4 and 51%) and the remaining 2 studies included mixed ethnic/racial groups.

Over one-third of the studies targeted commercial sex workers (CSWs) and either their clients or brothel managers (38%;  $k = 8$ ) and all of these were implemented in international settings. Over one-third targeted youth and young adults (38%,  $k = 8$ ), with an equal number of these studies conducted in the U.S. and international settings. The remaining studies targeted clinic patients (10%,  $k = 2$ ), individuals in high STI areas (4%,  $k = 1$ ), or adults in the general population (10%,  $k = 2$ ). Among those studies that reported the participants' age ( $k = 17$ ), the median age across all study samples was 22 (range 15–65 years). Among the studies that reported participant gender, the majority either targeted (100%) or consisted of a majority of women (65%,  $k = 13$ ). The majority of these were implemented in international settings (62%,  $k = 8$ ).

Regarding intervention components, SLCDIs were implemented in the communities for an average of 10 months (range 4–24 months) for the U.S.-based studies and 15 months (range 6–42 months) for international studies. The majority of the U.S.-based studies typically addressed availability ( $k = 4$ ), whereas the international studies typically implemented a combination of two or more SLCDI components within the intervention ( $k = 10$ ). Additionally, the majority of both U.S. and international studies (14 out of 21) had additional ILI, GLI or CLI components. Reported outcomes of interest included condom use ( $k = 20$ ), number of sex partners ( $k = 7$ ), condom acquisition/condom carrying ( $k = 6$ ), sexual initiation or abstinence ( $k = 5$  youth studies), and STI infection ( $k = 5$ ).

With regard to study design and quality, 10 studies (4 RCTs, 6 non-RCTs) evaluated SLCDI intervention effects by including a comparison arm not receiving a SLCDI. The median retention rate for these studies was 85.9% (range 40–99%) at the longest follow-up assessment (median: 6 months post-baseline for behavioral outcomes; 9.5 months post-baseline for biologic outcomes). All of

these studies, except two, used an intent-to-treat approach for analysis (i.e., analyzed participants as originally assigned regardless of exposure). The remaining 11 studies evaluated intervention effects by comparing data from independent cross-sectional samples assessed before and after implementation of a SLCDI. For this subset, the median follow-up assessment time for behavioral outcomes was 14 months post-baseline and the median follow-up time for biologic outcomes was 17.5 months post-baseline.

#### Overall Effect Sizes for HIV-Risk Sex Behaviors and STI Outcomes

Before we combined effect sizes, we tested whether study design and study location (U.S. vs. international) were associated with the effect size estimates. There was no evidence of such association as significant intervention effects were observed for both U.S. and international studies and regardless of the type of study design. Thus, the effect sizes across studies were consequently aggregated.

As seen in Table 3, significant intervention effects were found for the following outcomes: increased condom use (OR = 1.81; 95% CI = 1.51, 2.17;  $P < .01$ ; 20 studies;  $N = 23,574$ ; Fig. 2); increased condom acquisition/condom carrying (OR = 5.40; 95% CI = 1.86, 15.66;  $P < .05$ ; 6 studies;  $N = 3,304$ ), delaying sexual initiation/abstinence among youth (OR = 1.43; 95% CI = 1.01, 2.03;  $P < .05$ ; 5 studies;  $N = 6,692$ ); and reduced incidence of STIs (OR = 0.69; 95% CI = 0.53, 0.91,  $P < .01$ ; 5 studies;  $N = 2,196$ ). There was no significant intervention effect observed for the number of sex partners (OR = 1.28; 95% CI = 0.89, 1.85;  $P > .18$ ; 7 studies;  $N = 4,660$ ). Both the  $I^2$  statistic and the Q statistic indicate considerable heterogeneity among studies. However, the sensitivity test of each outcome did not reveal any individual effect size that exerted influence on the overall heterogeneity.

To evaluate the presence of publication bias, we used linear regression methods to investigate funnel plot

**Table 3** Overall effect size estimates for HIV-related behavioral and biological outcomes

Outcome	$k^a$	OR (95% CI)	$I^2$	Q-value	df (Q)	P-value (Q)
Condom use	20	1.81** (1.51, 2.17)	87.85	207.59	19	.00
Condom acquisition/condom carrying	6	5.40* (1.86, 15.66)	97.49	198.87	5	.00
Delayed sexual initiation/abstinence (youth)	5	1.43* (1.01, 2.03)	82.22	22.49	4	.00
No. of sex partners	7	1.28 (.89, 1.85)	88.08	50.35	6	.00
STD incidence	5	0.69** (.53, .91)	33.14	5.98	4	.20

CI confidence interval, STD sexually transmitted disease

\*  $P < .05$ ; \*\*  $P < .01$

<sup>a</sup>  $k$  indicates number of studies



asymmetry. There was no evidence of publication bias for any of the relevant outcomes (all  $P$ s > .05).

#### Stratified Analyses for Intervention Effects on Condom Use

To provide an overview of the pattern of findings, we present the findings on condom use from the combined data as well as findings stratified by study location (U.S.-based

vs. international) in Table 4. Interventions conducted in U.S.-based and international settings were both efficacious in improving condom use behaviors (Table 4), however, significantly greater efficacy was found among interventions that were implemented in international settings ( $Q_B = 6.81$ ,  $P < .05$ ). Since the pattern of findings tended to be qualitatively similar across these settings, the summary below focuses on the combined data which can also allow for greater power in detecting an intervention effect.

**Table 4** Stratified analyses for effects of intervention components on condom use behaviors

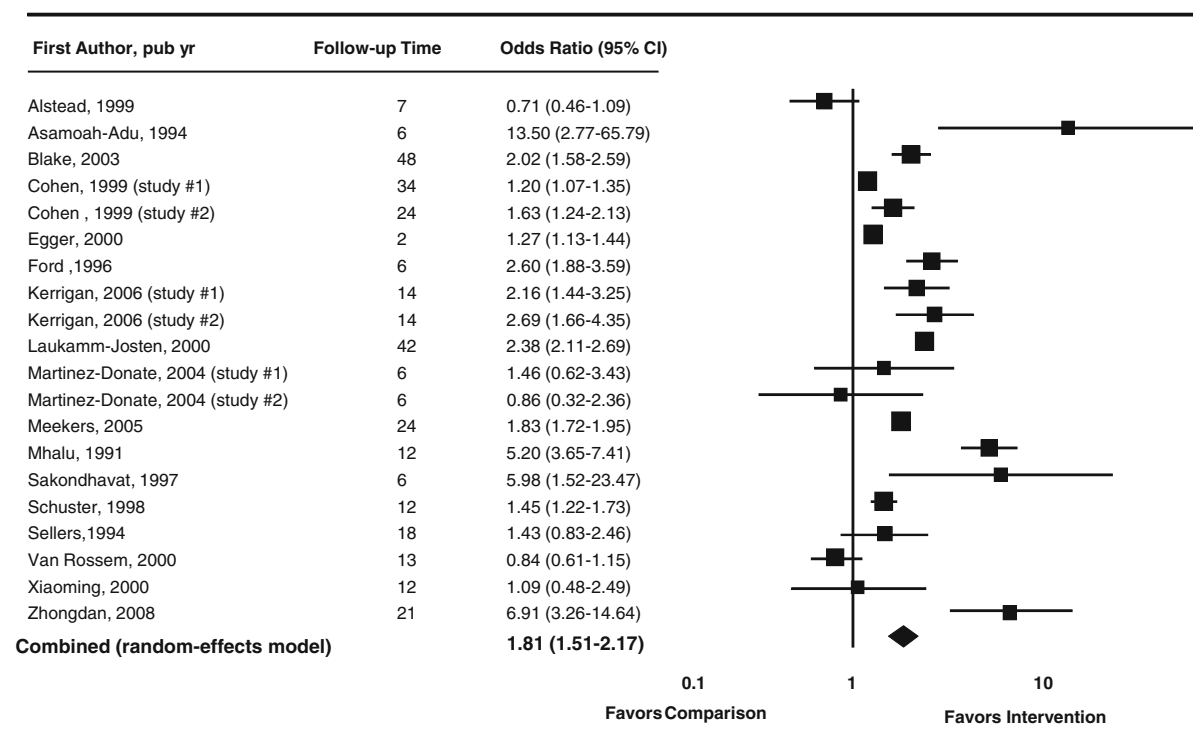
	Overall			U.S.-based			International		
	<i>k</i>	OR (95% CI)	$I^2$ (%)	<i>k</i>	OR (95% CI)	$I^2$ (%)	<i>k</i>	OR (95% CI)	$I^2$ (%)
Overall	20	1.81* (1.51, 2.17)	88	6	1.41* (1.10, 1.80)	82	14	2.09* (1.62, 2.70)	89
Specifically targeting youth									
Yes	8	1.32* (1.03, 1.68)	83	4	1.35 (.94, 1.96)	83	4	1.21 (.71, 2.06)	86
No	12	2.38* (1.75, 3.23)	90	2	1.48 (.92, 2.38)	89	10	2.79* (1.88, 4.14)	91
Specifically targeting female CSWs									
Yes	8	3.54* (2.41, 5.22)	77	0			8	3.54* (2.41, 5.22)	77
No	12	1.34* (1.13, 1.59)	84	6	1.41* (1.10, 1.80)	82	6	1.25 (.94, 1.65)	86
Specifically targeting adults									
Yes	2	1.27* (1.13, 1.43)	0	0			2	1.27* (1.13, 1.43)	0
No	18	1.87* (1.53, 2.29)	91	6	1.41* (1.10, 1.80)	82	12	2.36* (1.75, 3.17)	87
Specifically targeting high risk/STD clinic populations									
Yes	2	1.36* (1.01, 1.83)	76	2	1.36* (1.01, 1.83)	76	0		
No	18	1.89* (1.56, 2.30)	90	4	1.35 (.94, 1.96)	83	14	2.09* (1.62, 2.70)	89
Specifically targeting males									
Yes	3	2.14* (1.90, 2.42)	0	1	1.91* (1.47, 2.48)	0	2	2.21* (1.93, 2.53)	0
No	17	1.72* (1.39, 2.14)	89	5	1.32* (1.01, 1.73)	82	12	2.11* (1.53, 2.90)	90
Type of structural component: marginal effects									
Availability	14	1.70* (1.39, 2.07)	85	4	1.35 (.94, 1.96)	83	10	1.91* (1.49, 2.46)	85
Acceptability	11	1.63* (1.33, 2.00)	90	3	1.29 (.66, 2.51)	88	8	1.75* (1.39, 2.21)	83
Accessibility	11	2.30* (1.67, 3.17)	91	3	1.36* (1.08, 1.70)	54	8	3.18* (1.80, 5.61)	92
Type of structural component: combined effects									
Availability only	3	1.43* (1.21, 1.69)	0	1	1.45* (1.22, 1.73)	0	2	1.17 (.61, 2.24)	0
Acceptability only	0			0			0		
Accessibility only	4	2.70* (1.29, 5.63)	96	2	1.48 (.92, 2.38)	89	2	5.36* (3.78, 7.59)	0
Availability + Acceptability	6	1.64* (1.21, 2.21)	92	2	1.22 (.44, 3.39)	94	4	1.84* (1.29, 2.63)	92
Availability + Accessibility	2	6.68* (3.46, 12.90)	0	0			2	6.68* (3.46, 12.90)	0
Acceptability + Accessibility	2	1.79 (.89, 3.59)	94	0			2	1.79 (.89, 3.59)	94
Availability + Acceptability + Accessibility	3	1.40 (.91, 2.16)	58	1	1.43 (.88, 2.46)	0	2	1.37 (.65, 2.88)	5
Level of implementation: marginal effects									
Individual level	19	1.87* (1.55, 2.25)	89	5	1.42* (1.08, 1.87)	77	14	2.15* (1.69, 2.72)	91
Organizational	9	1.77* (1.34, 2.34)	90	2	1.21* (1.08, 1.35)	0	7	2.07* (1.38, 3.10)	86
Environmental level	6	1.87* (1.44, 2.42)	89	3	1.29 (.66, 2.51)	88	3	2.41* (1.77, 3.29)	92
Level of implementation: combined effects									
Individual level only	8	2.01* (1.41, 2.88)	91	2	1.64* (1.25, 2.13)	66	6	2.15* (1.14, 4.03)	92
Organizational level only	1	1.20* (1.07, 1.35)	0	1	1.20* (1.07, 1.35)	0	0		
Environmental level only	0			0			0		

**Table 4** continued

	Overall			U.S.-based			International		
	<i>k</i>	OR (95% CI)	I <sup>2</sup> (%)	<i>k</i>	OR (95% CI)	I <sup>2</sup> (%)	<i>k</i>	OR (95% CI)	I <sup>2</sup> (%)
Individual + Organizational level	5	1.72 (.95, 3.11)	83	0			5	1.72 (.95, 3.11)	83
Individual + Environmental level	3	1.57 (.92, 2.67)	93	2	1.22 (.44, 3.39)	94	1	2.24* (1.93, 2.59)	0
Organizational + Environmental level	0			0			0		
Individual + Organizational + Environmental	3	2.18* (1.28, 3.71)	77	1	1.43 (.83, 2.46)	0	2	2.83 (1.00, 7.97)	87
Additional intervention components: specific type									
SLI only	7	1.35* (1.09, 1.69)	80	4	1.33 (.95, 1.87)	87	3	1.56 (.71, 3.40)	64
SLI + ILI/GLI	6	2.61* (1.76, 3.86)	91	1	1.45* (1.22, 1.73)	0	5	3.06* (2.01, 4.65)	82
SLI + CLI	1	1.83* (1.72, 1.95)	0	0			1	1.83* (1.72, 1.95)	0
SLI + ILI/GLI + CLI	6	1.89* (1.07, 3.33)	87	1	1.43 (.83, 2.46)	0	5	2.01* (1.01, 3.99)	89
Additional intervention components: any versus none									
SLI only	7	1.35* (1.09, 1.69)	80	4	1.33 (.95, 1.87)	87	3	1.56 (.71, 3.40)	64
SLI + any ILI/GLI or CLI	13	2.13* (1.71, 2.66)	89	2	1.45* (1.23, 1.71)	0	11	2.33* (1.80, 3.01)	64

SLI structural-level interventions, ILI/GLI individual- and group-level interventions, CLI community-level interventions

\*  $P < .05$ , indicating significant intervention effects among that subset of studies

**Fig. 2** Overall effect size estimates for condom use behaviors

The tests described below were based on a-prior hypotheses for the potential moderator effects. The  $I^2$  values for most of the stratified analyses (Table 4) remained in the moderate to high range. When comparing the  $I^2$  values reported in Table 4 and the  $I^2$  value for condom use reported in Table 3, some moderators were associated with reduced heterogeneity (e.g., combined

availability, acceptability, and accessibility; specifically targeting high STD and clinic participants).

Several significant findings emerged when comparing intervention groups to comparison groups within each of the stratified analyses shown in Table 4. The significant intervention effects were seen in trials regardless of participants' characteristics (i.e., specifically targeting youth,

commercial sex workers, adults, high STD and clinic populations or males).

With regard to type of structural component (e.g., that which increased the availability, acceptability or accessibility of condoms), the marginal analyses revealed a significant positive effect on condom use for interventions that increased the availability of condoms (OR = 1.70; 95% CI = 1.39, 2.07;  $P < .01$ ;  $k = 14$ ). Similarly, significant positive intervention effects were also observed for interventions that increased acceptability of condoms (OR = 1.63; 95% CI = 1.33, 2.00;  $P < .01$ ;  $k = 11$ ) and for interventions that increased accessibility to condoms (OR = 2.30; 95% CI = 1.67, 3.17;  $P < .01$ ;  $k = 11$ ).

Assessing the combinations of structural components revealed a significant effect for interventions that implemented *availability* as a sole strategy (OR = 1.43; 95% CI = 1.21, 1.69;  $P < .01$ ;  $k = 3$ ), and also when availability was coupled with messages that promote the *acceptability* of condom use (OR = 1.64; 95% CI = 1.21, 2.21;  $P < .01$ ;  $k = 6$ ) or when availability was coupled with methods that increase *accessibility* to condoms (e.g., massive distribution of free condoms (OR = 6.68; 95% CI = 3.46, 12.90;  $P < .01$ ;  $k = 2$ ). Significant effects were also observed for interventions that focused on increasing *accessibility* to condoms as a sole strategy (OR = 2.70; 95% CI = 1.29, 5.63;  $P < .05$ ;  $k = 4$ ).

With regard to level of implementation (e.g., individual, organizational or environmental level), the marginal analyses revealed a significant positive effect on condom use for interventions implemented at the individual level (OR = 1.87; 95% CI = 1.55, 2.25;  $P < .01$ ;  $k = 19$ ). Significant positive intervention effects were also observed for interventions implemented at the organizational level (OR = 1.77; 95% CI = 1.34, 2.34;  $P < .01$ ;  $k = 9$ ) and for interventions implemented at the environmental level (OR = 1.87; 95% CI = 1.44, 2.42;  $P < .01$ ;  $k = 6$ ). When assessing the combination of the different levels of implementation, interventions implemented at the individual level only (OR = 2.01; 95% CI = 1.41, 2.88;  $P < .01$ ;  $k = 8$ ) or at the individual + organizational + environmental level (OR = 2.18; 95% CI = 1.28, 3.71;  $P < .01$ ;  $k = 3$ ) were both effective in increasing condom use behaviors.

An overall significant intervention effect was observed for solely structural-level (SLI only, with no ILI, GLI, or CLI components) interventions (OR = 1.35; 95% CI = 1.09, 1.69;  $P < .05$ ;  $k = 7$ ), as well as for structural-level interventions that also included either ILI/GLI (OR = 2.61; 95% CI = 1.76, 3.86;  $P < .05$ ;  $k = 6$ ), CLI (OR = 1.83; 95% CI = 1.72, 1.95;  $P < .05$ ;  $k = 1$ ), both ILI/GLI and CLI components (OR = 1.89; 95% CI = 1.07, 3.33;  $P < .05$ ;  $k = 6$ ), or *any* ILI/GLI or CLI components (OR = 2.13; 95% CI = 1.71, 2.66;  $P < .05$ ;  $k = 13$ ) (Table 4).

When comparing across the different subgroups of interventions to identify factors related to greater efficacy, several important factors emerged. Interventions that coupled SLCDIs with any additional ILI, GLI, or CLI components were associated with significantly greater efficacy than SLCDIs that solely implemented a structural-level component ( $Q_B = 8.10$ ,  $P < .01$ ). With regard to type of structural component, interventions that implemented availability or accessibility as sole strategies, as well as interventions that implemented availability + acceptability messages or availability + accessibility demonstrated significantly greater efficacy compared to all other types of SLCDIs ( $Q_B = 22.05$ ,  $P < .01$ ). With regard to level of implementation, SLCDIs that were implemented at the individual level or the individual + organizational + environmental level demonstrated significantly greater efficacy compared to all other types of SLCDIs ( $Q_B = 10.94$ ,  $P < .05$ ).

## Discussion

This meta-analysis of 21 U.S. and international studies indicates that structural-level condom distribution interventions (SLCDIs), evaluated as a whole, are efficacious in reducing various HIV sex-risk behaviors and incident STIs. The magnitude of intervention effects observed here are comparable, and in most cases, stronger, than those reported in other meta-analyses that examined intervention effects on HIV risk among various populations [36–40]. Risk reduction of this magnitude is also well within the range considered to be cost-effective when translated into final health outcomes [41].

Several characteristics of SLCDIs contribute to intervention efficacy based on our analysis of condom use behaviors. For example, interventions consisting solely of a structural component (SLI only) are efficacious, while interventions that combine SLIs with additional individual, small group or community-level activities show even greater efficacy. One possible reason for the increased efficacy of combining multi-level intervention components is that these different modalities address various aspects of influencing factors (e.g., norms, knowledge, skills, motivation and access) as well as prevention needs of individuals in affected communities. Additionally, interventions that increased the *availability* of condoms, or increased *accessibility* to condoms, as a distribution strategy were efficacious in increasing condom use behaviors. Interestingly, no intervention used *acceptability* as the only strategy as acceptability was addressed in combination with *availability* and/or *accessibility*. There were also no SLCDIs that were implemented at the environmental level only. SLCDIs implemented at the individual level were found to

be efficacious as well as SLCDIs implemented at all three levels (individual, organizational, and environmental).

With regard to applicability, it is very encouraging that SLCDIs promote condom use in various populations, such youth, adults, commercial sex workers, high STD populations and males. Our review further shows that SLCDIs targeting youth generally combined the SLI component with ILI/GLI components and focused on increasing the *availability* of condoms. Making condoms available at venues frequented by youth combined with ensuring that important prevention messages are relayed through individual and small group sessions is likely to result in greater condom use behaviors. Most importantly, our overall findings also show that SLCDIs have protective effects on sexual initiation among youth.

Commercial sex workers also benefitted from condom distribution programs. These interventions, from the international literature, targeted sex establishments (e.g., sex brothels) by trying to change the social and structural environment, in addition to making condoms more available or accessible. This finding is not too surprising because programs that aim to increase *accessibility* are designed to compensate for social inequities by making products more available for marginalized populations who may not have equal access to those resources (e.g., massive distribution of free condoms). In addition, creating an enabling environment through supportive policies and social norms around condom use may empower sex workers to refuse unprotected sex.

Several limitations of this meta-analysis warrant comment. Some of the more notable structural-level condom distribution programs in international settings were included in this review (e.g. 100% condom campaign in China [35]), however, several similar programs were not. A few 100% Condom Use Programs that have been conducted across many countries in Asia were excluded for various methodological reasons [42–46]. These reasons included study design issues (e.g., not reporting both pre-intervention and post-intervention data from independent cross-sectional samples or using a separate comparison group) or not providing sufficient data for meta-analyses (e.g., not providing sample sizes or variance estimates or citing unpublished data). These 100% Condom Use Programs have been successfully implemented throughout Asia over the years, and, in general, they have resulted in increases in condom use by commercial sex workers (CSWs) or their clients over time and declines in HIV/STD prevalence in the CSW community or the population as a whole [42–46]. The findings in our review are consistent with these results and we believe not including these did not bias our overall conclusions. Based on the framework proposed in our review (Table 1), these programs usually have addressed all three components (availability, acceptability, and

accessibility) at all three levels (individual, organizational, and environmental) which also supports the notion that multi-level or multi-component condom distribution programs may have the strongest efficacy. Some common elements of these programs that may play a role in their success include providing political support, focusing on owners and managers of sex work establishments (e.g., brothels, bars), conducting public campaigns or social marketing campaigns to normalize condom use, making condoms more available or accessible, and obtaining organizational support [43, 47].

The current review is limited to English-language publications. A post hoc supplemental search using the same search protocol as described in the “[Method](#)” section indicated that only a handful of foreign language citations out of almost 300 identified were potentially relevant to this review. Upon further examination, only two were identified as new studies that would potentially meet eligibility criteria [48, 49]. Since we did not have the capacity to translate the full text of these reports to confirm eligibility, we believe our search missed at most two studies due to the language restriction during our review period. Based on the abstracts, both studies support condom distribution for HIV prevention.

We reviewed the HIV prevention literature through September 2007. Since completing this review, we have identified several newly published evaluations of condom distribution programs in other international settings and with different populations (e.g., men who have sex with men) that may be relevant to our review [50–58]. The recent emphasis by UNAIDS on national level comprehensive HIV prevention approaches aimed towards universal access to prevention, treatment, care and support for all those in need [59] has led to evaluations of these types of programs in various parts of the world [53–58]. Many of these comprehensive HIV prevention approaches have included wide-scale condom promotion and distribution in combination with other HIV/STD prevention efforts, such as STD care or sexual health care. Our findings do support the 2007 UNAIDS Guidelines Toward Universal Care in the UNAIDS, which recommends universal and uninterrupted condom availability and integrated condom promotion into other health services as part of a comprehensive HIV prevention approach [59]. These recently published studies could build upon the evidence summarized in this review to better understand what works, how it works, in what settings, and with what populations.

We observed moderate to high levels of heterogeneity among studies, even after conducting stratified analyses. We initially attempted to conduct a multivariate random-effects metaregression analysis including covariates for the type of structural component, level of implementation, and additional intervention components in an effort to identify

independent predictors of intervention effects. Given the small number of studies in our review, and the concern for multicollinearity across variables, the findings were difficult to interpret and, thus, not presented. The studies included in this review are heterogeneous in terms of target group, intervention components, level of implementation, and study design. Although the heterogeneity was not substantially reduced with the univariate stratified analyses, our findings do support overall efficacy of SLCDIs and point to important directions for future consideration.

First, the remaining heterogeneity does suggest that additional factors related to efficacy, beyond those considered in this review, may exist. Our findings suggest that addressing availability, accessibility, or acceptability, as key barriers to condom use, does increase condom use. However, these programs do employ a variety of delivery methods, implementation strategies, or operational techniques in order to promote and distribute condoms. Questions related to implementation, such as how condoms were distributed, who distributed condoms, where they were distributed, duration of the program, types of social marketing, who delivered messages, additional services provided, etc., were beyond the scope of this review. Exploring these types of questions in future reviews can help to improve program implementation.

Second, condom distribution programs can significantly impact condom use behaviors among at-risk populations (e.g., youth, adults), as well as high-risk populations (e.g., commercial sex workers). Given the efficacy of these programs on condom use as well as STD incidence, future research should explore how other high-risk populations that are disproportionately affected by HIV and other STDs, such as African Americans, MSM and those in correctional facilities, may also benefit from such programs. It would also be important to include cost analyses to determine how the programs can be most effectively and efficiently delivered.

Finally, more than half of the studies included in our review were conducted in international settings, and those interventions were found to be significantly more efficacious than those conducted in the U.S. This finding suggests that much can be gained by understanding what makes those condom distribution programs more efficacious. Several evaluations of structural-level condom distribution programs, particularly in the international setting, have been published since conducting this review that could build upon the evidence summarized here to better understand the differences between the U.S. and international programs. Identifying effective strategies in one setting could also inform how to adapt and implement programs for different target populations or in new settings.

This systematic review supports the structural-level condom distribution intervention as an efficacious approach to increasing condom use and reducing HIV/STD

risk. Given the urgency of the HIV epidemic, making condoms more universally available, accessible, and acceptable, particularly in communities or venues reaching high-risk individuals, should be considered in any comprehensive HIV/STD prevention program. Further exploration around how best to implement condom distribution programs to maximize their reach and impact should be considered.

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